

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**  
**BOARD OF PATENT APPEALS AND INTERFERENCES**

#20  
10/16/02  
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Applicants: Woods et al.  
Title: Process for Hydroxyalkylating Carboxylic Acid-Functionalized  
Materials  
Serial No: 09/341,287  
Filed: August 19, 1999  
Atty. Docket No.: 1221.002USU/LC-302/PCT/US  
Examiner: D. R. Wilson  
Art Unit: 1713



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Commissioner of Patents  
Washington, DC. 20231

**APPELLANTS' APPEAL BRIEF FILED UNDER 35 U.S.C. §134**

Sir:

This Appeal Brief is herewith filed under 35 U.S.C. §134 and in accordance with the provisions of 37 C.F.R. §1.192(a), and complies with the requirements set forth in 37 C.F.R. §1.192(c). The claims herein on appeal are set forth in the Appendix.

**REAL PARTY IN INTEREST**

The real party in interest is Henkel Loctite Corporation, having a business address at 1001 Trout Brook Crossing, Rocky Hill, Connecticut 06067, USA.

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**RELATED APPEALS AND INTERFERENCES**

There are no other appeals or interferences known to the Appellant that will directly affect, or be directly affected by, or have a bearing on, the Board's decision in the pending appeal.

### **STATUS OF CLAIMS**

Claims 23-28, 31, 34-37 and 43-44 have been rejected in an action made final by the Examiner, and are the subject of this appeal. Claims 23-28, 31, 34-37 and 43-44 can be found in the Appendix. Claims 29-30, 32-33 and 41-42 drawn to non-elected species, which may be rejoined upon allowance of the subject claims, and claims 38-40 drawn to non-elected invention, are not included in the Appendix.

### **STATUS OF AMENDMENTS**

An amendment was filed on November 5, 2001, after an interview with the Examiner on October 2, 2001 in response to a rejection of the pending claims in an Office Action dated July 3, 2001. The Amendment included a Declaration under 37 C.F.R. § 1.132 responsive to multi-reference rejections to show that a person of ordinary skill in the art would not be motivated to replace ethylene oxide with ethylene carbonate. The rejection of the pending claims, namely claims 23-28, 31, 34-37 and 43-44, was made final in an Office Action dated February 20, 2002.

Appellant's believe that the rejection of claims 23-28, 31, 34-37 and 43-44 under 35 USC §103 has been overcome by the prior amendments, Declaration under 37 C.F.R. 1.132 and arguments presented during the prosecution.

### **SUMMARY OF INVENTION**

The following concise summary of the invention as defined by the pending claims is supported by the pending specification.

The present invention includes a process for preparing a dihydroxyl-functionalized material by hydroxyalkylating a dicarboxylic acid-functionalized material using a hydroxyalkylating reagent, in the presence of a phase transfer catalyst.

More particularly, the process of the present invention includes the step of reacting: (a) a dicarboxylic acid-functionalized polymer of polybutadiene, poly(butadiene-co-acrylonitrile), poly(acrylonitrile) or combinations thereof; and (b) a hydroxyalkylating reagent, such as, a carbocyclic carbonate. The reaction is carried out in the presence a phase transfer catalyst, such as, tetraethylammonium iodide as the phase transfer catalyst.

The dicarboxylic acid-functionalized material has carboxyl-functional groups such as R and R<sup>1</sup> groups that are COOH or CAA<sup>1</sup>-X-COOH. A and A<sup>1</sup> can independently be hydrogen, halogen, cyano, linear or branched alkyl having from 1 to about 5 carbon atoms and wherein X is a linear or branched alkyl having from 1 to about 5 carbon atoms.

As can be seen, the invention provides a process for preparing a dihydroxyl-functionalized materials that can be used in adhesive, coating or sealant compositions having improved properties, including toughness and elongation and curability through a gap of more than 40 mils.

### **STATEMENT OF ISSUES**

The issue presented for review is the propriety of the Examiner's final rejection of claims 23-28, 31, 34-37 and 43-44 under 35 U.S.C. §103(a) as allegedly being obvious over Okamoto in view of alleged admissions found in the specification, Merck Index, Wu and Yoshino, in further view of Wu or Yoshino.

Claim 25 has been rejected under 35 U.S.C. § 103 (a) as allegedly being obvious over Okamoto in view of alleged admissions found in the specification, Merck Index, Wu and Yoshino, in further view of Wu or Yoshino as applied to claims 23-28, 31, 34-37 and 43-44 above and further in view of alleged admissions found in the specification.

### **GROUPING OF CLAIMS**

Claims 23-28, 31, 34-37 and 43-44 form a group for contesting the rejection under 35 U.S.C. §103(a) as allegedly being obvious over U.S. Patent No. 4,444,692 to Okamoto (hereafter Okamoto) in view of alleged admissions found in the specification, Merck Index, U.S. Patent No. 4,266,046 to Wu (hereafter Wu) and "Synthetic Studies with Carbonates. Part 6. Syntheses of 2-Hydroxyethyl Derivatives by Reactions of Ethylene Carbonate with carboxylic Acids or Heterocycles in the Presence of Tetraethylammonium Halides or under Autocatalytic Conditions", J.C.S. Perkin I, 1266-72 (1977) by Yoshino (hereafter Yoshino), in further view of Wu or Yoshino.

The claims do not stand or fall together.

### **ARGUMENTS**

The rejection of claims 23-28, 31, 34-37 and 43-44 under 35 U.S.C. §103(a) as allegedly being obvious over Okamoto in view of alleged admissions found in the specification, Merck Index, Wu and Yoshino, in further view of Wu or Yoshino is improper because the combination of the references relied upon for the rejection is unclear, confusing and in part meaningless.

Okamoto	<b><u>in view of</u></b>	Admissions	<b><u>in further view of</u></b>	Wu
		Merck Index		<b><u>or</u></b>
		Wu		Yoshino
		<b><u>and</u></b>		
		Yoshino		

The 35 U.S.C. §103(a) rejection based on above combination of references requires "Wu" to be "in further view of" itself. Further, the combination requires "Yoshino" to be "in further view of" itself. Still further, even if one assumes that what is intended is "or" instead of "and," the 35 U.S.C. §103(a) rejection would still require "Wu" to be "in further view of" itself as well as "Yoshino" to be "in further view of" itself.

Accordingly, the rejection of claims 23-28, 31, 34-37 and 43-44 under 35 U.S.C. §103(a) as allegedly being obvious over Okamoto in view of alleged admissions found in the specification, Merck Index, Wu and Yoshino, in further view of Wu or Yoshino is unclear, confusing and in part meaningless, and thus, improper. Therefore, Appellant's submit the rejection should be withdrawn.

If for the sake of argument one assumes that the intended combination of references is "being obvious over Okamoto in view of alleged admissions found in the specification, Merck Index, Wu and Yoshino," Appellant's arguments include the following:

(a) The rejection relies upon alleged admissions found in the specification as its centerpiece to provide motivation to combine these disparate references. Thus, the so-called admissions found in the specification alleged by the Final Office Action appears to be based on a statement of advantages of the present invention over the methods of the prior art.

The present application states that ethylene carbonate, which is the reagent employed as the hydroxylating agent in the present invention, has the advantage of being a low toxicity reagent relative to ethylene oxide, which has relatively high toxicity. The Final Office Action goes on to conclude, incorrectly in our view, that a person of ordinary skill in the art would have sufficient motivation to combine the cited references to arrive at the process defined by the instant claims.

Appellant points out that recognition of an advantage, which typically occurs either concurrent with or post-invention, does not provide a person of ordinary skill in the art motivation to modify one or more references to achieve that advantage. The instant claims are rejected as being obvious over an "advantage" described in the present application, with a requirement to combine that advantage with four additional references. None of the four cited references teaches or suggests how to modify the various processes described in the remaining references to arrive at the process defined by the instant claims.

To properly combine two or more references, there must be a teaching or a suggestion in the references to combine. Without such a teaching or a suggestion, a person of ordinary skill in the art would not be motivated to combine two or more references.

Even if all the elements of a claim are described in separate references, there has to be provided a teaching or a suggestion in the references to provide motivation for a person of ordinary skill in the art to combine the references in question. Thus, a showing of motivation is one of the essential requirements that must be met to establish a *prima facie* case of obviousness.

Further, none of the cited references teach or suggest to select various elements from a large number of references and combine them in a manner that provides a reasonable expectation of success in producing a process according to the present invention. In addition, none of the cited references teach or suggest the desirability of replacing the ethylene oxide/tertiary amine catalyst in one reference by a carbocyclic carbonate/phase transfer catalyst of another with a reasonable expectation of success.

Thus, in the absence of a teaching or a suggestion of the desirability of such a replacement, the cited references alone or in combination do not render the claims of the instant invention obvious.

(b) Regarding the toxicity of ethylene oxide and that nearly all chemicals used in the chemical industry, including ethylene oxide, are toxic to one degree or another to humans, animals and the environment and despite this, millions of pounds of ethylene oxide are produced annually by the chemical industry.

Thus, a person of ordinary skill in the art would not be motivated to look for a replacement for ethylene oxide simply because of its toxicity. The mere fact that a chemical is hazardous is not, in and of itself, a suggestion to replace ethylene oxide with another chemical, particularly in the present case, because ethylene oxide is an inexpensive hydroxyalkylating agent. The "added cost to provide the necessary safety and protection" argument advanced by the Examiner is not persuasive because ethylene oxide is so inexpensive that safety costs would not be sufficient to offset the higher cost of alternative reagents. Accordingly, Appellant points out that the recognition of the advantages of the present invention does not fulfill the necessary motivation requirement to look for alternatives or to combine Okamoto with Wu or Yoshino.

(c) In support for the above, Appellant has submitted a Declaration under 37 C.F.R. § 1.132 in response to the multi-reference rejections to show that a person of ordinary skill in the art would not be motivated to replace ethylene oxide with ethylene carbonate.

More specifically, the Declaration states that nearly all chemicals used in the chemical industry, including ethylene oxide, are toxic to one degree or another. Despite this, millions of pounds of ethylene oxide are produced and used annually by the chemical industry. Thus, one would not automatically replace ethylene oxide for being hazardous. As mentioned above, ethylene and propylene oxides are so inexpensive that any added safety costs associated with their use would be insufficient to offset the higher cost of ethylene and propylene carbonates and thus, would not provide sufficient motivation to replace ethylene oxide with ethylene carbonate.

In addition, the molecular weight of ethylene carbonate is twice the molecular weight of ethylene oxide. In the hydroxyalkylation of a carboxyfunctional material using ethylene oxide as the hydroxyalkylating agent, 100% of the weight of the ethylene oxide would be added to the carboxyfunctional material, so that all of the hydroxyalkylating agent is retained in the reaction product without any loss of material.

In sharp contrast, in the hydroxyalkylation of a carboxyfunctional material using ethylene carbonate as the hydroxyalkylating agent, only 50% of the weight of the ethylene carbonate is added to the carboxyfunctional material. The remaining 50% is lost as CO<sub>2</sub>, a by-product that requires disposal. Thus, the 50% weight loss and doubling the raw material cost would quadruple the raw material costs, so that a person of ordinary skill in the art would not have motivation to replace ethylene oxide with ethylene carbonate.

The Final Office Action refers to the high cost of ethylene oxide available from Aldrich Chemical, Inc.

Appellant points out that chemical plants that use ethylene oxide do not purchase this chemical from Aldrich, which provides ethylene oxide as a "research" chemical in small cylinders, not as a chemical in industrial scale quantities available at more favorable pricing. Accordingly, the reference to the high cost of ethylene oxide from Aldrich is not relevant to the issue of motivation.

(c) Replacement of the ethylene oxide/tertiary amine catalyst by a carbocyclic carbonate/phase transfer catalyst in the process of Okamoto is not taught or suggested by the cited art.

Okamoto describes a process for preparing a hydroxyl-terminated polymer using:

(i) ethylene oxide; and



- (ii) a tertiary amine catalyst.

The Final Office Action alleges that, because ethylene oxide is a hazardous material, it would be undesirable to use it as a reactant. This assumption is derived from the statement of advantages of the present invention over the methods of the prior art.

Wu describes a process for preparing polyesters of polycarboxylic acids using a cyclic carbonate with a monomeric polyfunctional carboxylic acid in the presence of an alkylammonium halide catalyst.

Yoshino describes preparation of a mixture of mono- and di-esters of ethylene glycol with a mono-carboxylic acid by the reaction of a monocarboxylic acid with ethylene carbonate in the presence of an alkylammonium halide catalyst.

The differences between the disclosures of these references and the invention defined by the instant claims is as follows:

Okamoto describes a process for preparing a hydroxyl-terminated polymer using ethylene oxide/tertiary amine catalyst combination but does not use carbocyclic carbonate/phase transfer catalyst combination.

Wu uses a cyclic carbonate/ alkylammonium halide catalyst with a **monomeric** polyfunctional carboxylic acid, such as, terephthalic acid, as the starting material, to prepare **polyesters** but does not use a dicarboxylic acid-functionalized polymer of polybutadiene, poly(butadiene-co-acrylonitrile), poly(acrylonitrile) or a combination thereof to prepare a dihydroxyl-functionalized material.

Yoshino uses ethylene carbonate/alkylammonium halide catalyst with a **mono**-carboxylic acid as the starting material to prepare a mixture of mono- and di-esters of ethylene glycol but, as in the case of Wu, does not use a dicarboxylic acid-

functionalized polymer of polybutadiene, poly(butadiene-co-acrylonitrile), poly(acrylonitrile) or a combination thereof to prepare a dihydroxyl-functionalized material.

There is no teaching or suggestion in either Wu or Yoshino to use a dicarboxylic acid-functionalized polymer of polybutadiene, poly(butadiene-co-acrylonitrile), poly(acrylonitrile) or a combination thereof to prepare a dihydroxyl-functionalized material.

Conversely, there is no teaching or suggestion in Okamoto to replace ethylene oxide/tertiary amine catalyst combination with ethylene carbonate/phase transfer catalyst such as, alkylammonium halide.

There is no suggestion in Okamoto to replace the basic tertiary amine catalyst with a neutral phase transfer catalyst. There is no suggestion in either Wu or Yoshino that phase transfer catalysts and tertiary amine catalyst are equivalent or interchangeable. There is no suggestion in any of the references that the basic tertiary amine catalyst can be replaced with a neutral phase transfer catalyst, or *vice versa*, and obtain the same result.

Further, Neither Wu nor Yoshino teach or suggest that the various starting materials used in either Wu or Yoshino could be replaced with a dicarboxylic acid-functionalized polymer of polybutadiene, poly(butadiene-co-acrylonitrile), poly(acrylonitrile) or a combination thereof to prepare a dihydroxyl-functionalized material.

A person of ordinary skill in the art would have to instinctively know how to pick and choose the right ingredients from one reference and simultaneously pick and choose the right ingredients from another reference to come up with the exact combination of ingredients to produce all the elements of the instant process. Thus, without a specific suggestion to modify the various teachings to obtain the

claimed process of the present invention, Wu or Yoshino are not combinable with Okamoto.

(d) Controlling the molecular weight of the hydroxyalkylated final product is advantageous for producing a useful hydroxyalkylated final product. The process according to the present invention provides means for controlling the molecular weight of the hydroxyalkylated final product produced and, as a result, avoids extensive resin extension. This is an unexpected result not taught or suggested by any of the cited references.

The absence of excessive resin extension in the dihydroxyl-functionalized material, is an important aspect of the present invention because low fusible-materials and block prepolymer resins prepared from HTBNs and organic diisocyanates are constrained by the permissible molecular weights of the reactants to achieve appropriate physical properties in the final product. High molecular weight materials would not be useful in the compositions of the present invention.

As shown above, there is no suggestion in any combination of the cited references that provide motivation for a person of ordinary skill in the art to replace ethylene oxide with ethylene carbonate and further replace a tertiary amine catalyst with a phase transfer catalyst.

The toxicity of a chemical alone is insufficient to provide the requisite motivation, which is missing in the above-cited references, to replace ethylene oxide with ethylene carbonate and further replace the tertiary amine catalyst with a phase transfer catalyst and still further, replace the various carboxylic acid starting materials with a dicarboxylic acid-functionalized polymer of polybutadiene, poly(butadiene-co-acrylonitrile), poly(acrylonitrile) or a combination thereof to prepare a dihydroxyl-functionalized material.

Legal argument

## **LEGAL ARGUMENTS**

To properly combine two or more references, there must be a teaching or a suggestion in the references to combine. Without such a teaching or a suggestion, a person of ordinary skill in the art would not be motivated to combine two or more references.

Even if all the elements of a claim are described in separate references, there has to be provided a teaching or a suggestion in the references to provide motivation for a person of ordinary skill in the art to combine the references in question. Thus, a showing of motivation is one of the essential requirements that must be met to establish a *prima facie* case of obviousness (see MPEP § 2142 and *In re Rouffet*, 47 USPQ 2d at 1457-1458).

Absent such a teaching or suggestion to provide motivation to combine, the cited references are not properly combinable because a person of ordinary skill in the art would not be able to arrive at the claimed invention except through either extensive experimentation or impermissible hindsight.

None of the cited references teach or suggest to select various elements from a large number of references and combine them in a manner that provides a reasonable expectation of success in producing a process according to the present invention. In addition, none of the cited references teach or suggest the desirability of replacing the ethylene oxide/tertiary amine catalyst in one reference by a carbocyclic carbonate/phase transfer catalyst of another with a reasonable expectation of success. Thus, in the absence of a teaching or a suggestion of the desirability of such a replacement, the cited references alone or in combination do not render the claims of the instant invention obvious (see MPEP 2143.01).

Therefore, the criteria for establishing a *prima facie* case of obviousness have not been met (see MPEP 2143, citing *In Re Vaeck*, 947 F.2d 488, 20 USPQ 2d 1438 (Fed. Cir. 1991)).

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Based on the foregoing, reversal of the Final Rejection of pending claims is proper and indication of their allowability is respectfully requested.

Respectfully submitted,

*V. Alexanian*

Date: September 30, 2002

By: \_\_\_\_\_

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## **APPENDIX**

Claims 23-44, herein on appeal, are set forth below.

23. (Amended) A process for preparing a dihydroxyl-functionalized material by hydroxyalkylating a dicarboxylic acid-functionalized material, said process comprising the step of: reacting as reactants: (a) a dicarboxylic acid-functionalized material selected from the group consisting of dicarboxylic acid-functionalized polymers of: polybutadiene, poly(butadiene-co-acrylonitrile), poly(acrylonitrile) and combinations thereof; and (b) a hydroxyalkylating reagent selected from the group consisting of: a carbocyclic carbonate and a carbocyclic sulfite; in the presence of: (c) a phase transfer catalyst under conditions sufficient to form a dihydroxyl-functionalized material.

24. The process according to claim 23, wherein said dicarboxylic acid-functionalized material has carboxyl-functional groups independently selected from the group consisting of: R and R<sup>1</sup>, wherein each R and R<sup>1</sup> is independently selected from the group consisting of: COOH or CAA<sup>1</sup>-X-COOH, wherein each A and A<sup>1</sup> is independently selected from the group consisting of: hydrogen, halogen, cyano, linear or branched alkyl having from 1 to about 5 carbon atoms and wherein X is a linear or branched alkyl having from 1 to about 5 carbon atoms.

25. (Amended) The process according to claim 23, wherein said dicarboxylic acid-functionalized material has a number average molecular weight of from about 3,100 to about 4,200.

26. The process according to claim 23, wherein said hydroxyalkylating reactant is a member selected from the group consisting of carbocyclic carbonate, carbocyclic sulfites and combinations thereof.

27. The process according to claim 26, wherein said carbocyclic carbonate is a member selected from the group consisting of ethylene carbonate, 1,3-propylene carbonate, 2-methyl-1,2-ethylene carbonate, 3-methyl-1,3-propylene carbonate, 1,2-dimethyl ethylene carbonate, 2,2-dimethyl butylene carbonate and combinations thereof.

28. The process according to claim 26, wherein said carbocyclic carbonate is ethylene carbonate.

31. The process according to claim 23, wherein said dihydroxyl-functionalized material is selected from the group consisting of the dihydroxyl-functionalized polymers of: polybutadiene, poly(butadiene-co-acrylonitrile), polyacrylonitrile, and combinations thereof.

34. The process according to claim 23, wherein said phase transfer catalyst is a member selected from the group consisting of quaternary ammonium halides, phosphonium halides, sulfonium halides, crown ethers, calixarenes and combinations thereof.

35. The process according to claim 23, wherein said phase transfer catalyst is a member selected from the group consisting of tetrabutyl ammonium iodide, tetraethyl ammonium iodide, benzyl trimethyl ammonium chloride and ethyl triphenylphosphonium bromide.

36. The process according to claim 23, wherein the molar ratio of said hydroxyalkylating reagent to said dicarboxylic acid-functionalized material is from about 3.8 to about 4.5.

37. The process according to claim 23, wherein said carboxylic acid-functionalized material is a member selected from the group consisting of carboxylic acid-functionalized polybutadiene and carboxylic acid-functionalized poly(butadiene-co-acrylonitrile).

43. The process according to claim 23, wherein said dihydroxyl-functionalized material has a number average molecular weight of up to about three times greater than the molecular weight of said dicarboxylic acid-functionalized material.

44. The process according to claim 23, wherein said dihydroxyl-functionalized material has a number average molecular weight from about 2.7 to about 3.0 times greater than the molecular weight of said dicarboxylic acid-functionalized material.





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Issue Fee	Priority Document	Formal Drawings	Notice of Appeal
Certified Copy	Terminal Disclaimer	Request for Recon.	References (IDS)/PTO 1449
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